

SEQUENCE LISTING

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 Imai, Shin-ichiro
 Armstrong, Christopher

<120> METHODS FOR IDENTIFYING AGENTS WHICH
 ALTER HISTINE PROTEIN ACETYLATION, DECREASE AGING, INCREASE
 LIFESPAN

<130> 0050.1618-000

<140> 09/461,580

<141> 1999-12-15

<160> 35

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 737

<212> PRT

<213> Mus musculus

<400> 1

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		20						25				30			
Arg	Lys	Arg	Pro	Arg	Arg	Asp	Gly	Pro	Gly	Leu	Gly	Arg	Ser	Pro	Gly
	35					40					45				
Glu	Pro	Ser	Ala	Ala	Val	Ala	Pro	Ala	Ala	Ala	Gly	Cys	Glu	Ala	Ala
	50				55					60					
Ser	Ala	Ala	Ala	Pro	Ala	Ala	Leu	Trp	Arg	Glu	Ala	Ala	Gly	Ala	Ala
65			70					75						80	
Ala	Ser	Ala	Glu	Arg	Glu	Ala	Pro	Ala	Thr	Ala	Val	Ala	Gly	Asp	Gly
		85						90				95			
Asp	Asn	Gly	Ser	Gly	Leu	Arg	Arg	Glu	Pro	Arg	Ala	Ala	Asp	Asp	Phe
	100							105					110		
Asp	Asp	Asp	Glu	Gly	Glu	Glu	Glu	Asp	Glu	Ala	Ala	Ala	Ala	Ala	Ala
	115					120						125			
Ala	Ala	Ala	Ile	Gly	Tyr	Arg	Asp	Asn	Leu	Leu	Leu	Thr	Asp	Gly	Leu
	130				135				140						
Leu	Thr	Asn	Gly	Phe	His	Ser	Cys	Glu	Ser	Asp	Asp	Asp	Asp	Arg	Thr
145				150					155					160	
Ser	His	Ala	Ser	Ser	Ser	Asp	Trp	Thr	Pro	Arg	Pro	Arg	Ile	Gly	Pro
		165						170					175		
Tyr	Thr	Phe	Val	Gln	Gln	His	Leu	Met	Ile	Gly	Thr	Asp	Pro	Arg	Thr
		180					185					190			
Ile	Leu	Lys	Asp	Leu	Leu	Pro	Glu	Thr	Ile	Pro	Pro	Pro	Glu	Leu	Asp
	195					200						205			
Asp	Met	Thr	Leu	Trp	Gln	Ile	Val	Ile	Asn	Ile	Leu	Ser	Glu	Pro	Pro
	210				215					220					
Lys	Arg	Lys	Lys	Arg	Lys	Asp	Ile	Asn	Thr	Ile	Glu	Asp	Ala	Val	Lys
225				230					235					240	
Leu	Leu	Gln	Glu	Cys	Lys	Lys	Ile	Ile	Val	Leu	Thr	Gly	Ala	Gly	Val
		245					250					255			
Ser	Val	Ser	Cys	Gly	Ile	Pro	Asp	Phe	Arg	Ser	Arg	Asp	Gly	Ile	Tyr

0050.1618-000

										260			265			270		
Ala	Arg	Leu	Ala	Val	Asp	Phe	Pro	Asp	Leu	Pro	Asp	Pro	Gln	Ala	Met			
		275					280					285						
Phe	Asp	Ile	Glu	Tyr	Phe	Arg	Lys	Asp	Pro	Arg	Pro	Phe	Phe	Lys	Phe			
		290					295					300						
Ala	Lys	Glu	Ile	Tyr	Pro	Gly	Gln	Phe	Gln	Pro	Ser	Leu	Cys	His	Lys			
305					310					315					320			
Phe	Ile	Ala	Leu	Ser	Asp	Lys	Glu	Gly	Lys	Leu	Leu	Arg	Asn	Tyr	Thr			
				325					330					335				
Gln	Asn	Ile	Asp	Thr	Leu	Glu	Gln	Val	Ala	Gly	Ile	Gln	Arg	Ile	Leu			
				340					345					350				
Gln	Cys	His	Gly	Ser	Phe	Ala	Thr	Ala	Ser	Cys	Leu	Ile	Cys	Lys	Tyr			
		355					360					365						
Lys	Val	Asp	Cys	Glu	Ala	Val	Arg	Gly	Asp	Ile	Phe	Asn	Gln	Val	Val			
		370					375					380						
Pro	Arg	Cys	Pro	Arg	Cys	Pro	Ala	Asp	Glu	Pro	Leu	Ala	Ile	Met	Lys			
385					390					395					400			
Pro	Glu	Ile	Val	Phe	Gly	Glu	Asn	Leu	Pro	Glu	Gln	Phe	His	Arg				
				405					410					415				
Ala	Met	Lys	Tyr	Asp	Lys	Asp	Glu	Val	Asp	Leu	Leu	Ile	Val	Ile	Gly			
				420					425					430				
Ser	Ser	Leu	Lys	Val	Arg	Pro	Val	Ala	Leu	Ile	Pro	Ser	Ser	Ile	Pro			
		435					440					445						
His	Glu	Val	Pro	Gln	Ile	Leu	Ile	Asn	Arg	Glu	Pro	Leu	Pro	His	Leu			
		450					455					460						
His	Phe	Asp	Val	Glu	Leu	Leu	Gly	Asp	Cys	Asp	Val	Ile	Ile	Asn	Glu			
465					470					475					480			
Leu	Cys	His	Arg	Leu	Gly	Gly	Glu	Tyr	Ala	Lys	Leu	Cys	Cys	Asn	Pro			
				485					490					495				
Val	Lys	Leu	Ser	Glu	Ile	Thr	Glu	Lys	Pro	Pro	Arg	Pro	Gln	Lys	Glu			
				500					505					510				
Leu	Val	His	Leu	Ser	Glu	Leu	Pro	Pro	Thr	Pro	Leu	His	Ile	Ser	Glu			
		515					520					525						
Asp	Ser	Ser	Ser	Pro	Glu	Arg	Thr	Val	Pro	Gln	Asp	Ser	Ser	Val	Ile			
		530					535					540						
Ala	Thr	Leu	Val	Asp	Gln	Ala	Thr	Asn	Asn	Asn	Val	Asn	Asp	Leu	Glu			
545					550					555					560			
Val	Ser	Glu	Ser	Ser	Cys	Val	Glu	Glu	Lys	Pro	Gln	Glu	Val	Gln	Thr			
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Ser

<210> 2

<211> 272

<212> PRT

<213> *Saccharomyces cerevisiae*

<400> 2

Ile Asn Lys Val Leu Cys Thr Arg Leu Arg Leu Ser Asn Phe Phe Thr
 1 5 10 15
 Ile Asp His Phe Ile Gln Lys Leu His Thr Ala Arg Lys Ile Leu Val
 20 25 30
 Leu Thr Gly Ala Gly Val Ser Thr Ser Leu Gly Ile Pro Asp Phe Arg
 35 40 45
 Ser Ser Glu Gly Phe Tyr Ser Lys Ile Lys His Leu Gly Leu Asp Asp
 50 55 60
 Pro Gln Asp Val Phe Asn Tyr Asn Ile Phe Met His Asp Pro Ser Val
 65 70 75 80
 Phe Tyr Asn Ile Ala Asn Met Val Leu Pro Pro Glu Lys Ile Tyr Ser
 85 90 95
 Pro Leu His Ser Phe Ile Lys Met Leu Gln Met Lys Gly Lys Leu Leu
 100 105 110
 Arg Asn Tyr Thr Gln Asn Ile Asp Asn Leu Glu Ser Tyr Ala Gly Ile
 115 120 125
 Ser Thr Asp Lys Leu Val Gln Cys His Gly Ser Phe Ala Thr Ala Thr
 130 135 140
 Cys Val Thr Cys His Trp Asn Leu Pro Gly Glu Arg Ile Phe Asn Lys
 145 150 155 160
 Ile Arg Asn Leu Glu Leu Pro Leu Cys Pro Tyr Cys Tyr Lys Lys Arg
 165 170 175
 Arg Glu Tyr Phe Pro Glu Gly Tyr Asn Asn Lys Val Gly Val Ala Ala
 180 185 190
 Ser Gln Gly Ser Met Ser Glu Arg Pro Pro Tyr Ile Leu Asn Ser Tyr
 195 200 205
 Gly Val Leu Lys Pro Asp Ile Thr Phe Phe Gly Glu Ala Leu Pro Asn
 210 215 220
 Lys Phe His Lys Ser Ile Arg Glu Asp Ile Leu Glu Cys Asp Leu Leu
 225 230 235 240
 Ile Cys Ile Gly Thr Ser Leu Lys Val Ala Pro Val Ser Glu Ile Val
 245 250 255
 Asn Met Val Pro Ser His Val Pro Gln Val Leu Ile Asn Arg Asp Pro
 260 265 270

<210> 3

<211> 267

<212> PRT

<213> *Saccharomyces cerevisiae*

<400> 3

Ile Asn Lys Val Leu Ser Thr Arg Leu Arg Leu Pro Asn Phe Asn Thr
 1 5 10 15
 Ile Asp His Phe Thr Ala Thr Leu Arg Asn Ala Lys Lys Ile Leu Val
 20 25 30
 Leu Thr Gly Ala Gly Val Ser Thr Ser Leu Gly Ile Pro Asp Phe Arg
 35 40 45

Ser Ser Glu Gly Phe Tyr Ser Lys Ile Arg His Leu Gly Leu Glu Asp
 50 55 60
 Pro Gln Asp Val Phe Asn Leu Asp Ile Phe Leu Gln Asp Pro Ser Val
 65 70 75 80
 Phe Tyr Asn Ile Ala His Met Val Leu Pro Pro Glu Asn Met Tyr Ser
 85 90 95
 Pro Leu His Ser Phe Ile Lys Met Leu Gln Asp Lys Gly Lys Leu Leu
 100 105 110
 Arg Asn Tyr Thr Gln Asn Ile Asp Asn Leu Glu Ser Tyr Ala Gly Ile
 115 120 125
 Asp Pro Asp Lys Leu Val Gln Cys His Gly Ser Phe Ala Thr Ala Ser
 130 135 140
 Cys Val Thr Cys His Trp Gln Ile Pro Gly Glu Lys Ile Phe Glu Asn
 145 150 155 160
 Ile Arg Asn Leu Glu Leu Pro Leu Cys Pro Tyr Cys Tyr Gln Lys Arg
 165 170 175
 Lys Gln Tyr Phe Pro Met Ser Asn Gly Asn Asn Thr Val Gln Thr Asn
 180 185 190
 Ile Asn Phe Asn Ser Pro Ile Leu Lys Ser Tyr Gly Val Leu Lys Pro
 195 200 205
 Asp Met Thr Phe Phe Gly Glu Ala Leu Pro Ser Arg Phe His Lys Thr
 210 215 220
 Ile Arg Lys Asp Ile Leu Glu Cys Asp Leu Leu Ile Cys Ile Gly Thr
 225 230 235 240
 Ser Leu Lys Val Ala Pro Val Ser Glu Ile Val Asn Met Val Pro Ser
 245 250 255
 His Val Pro Gln Ile Leu Ile Asn Arg Asp Met
 260 265

<210> 4

<211> 245

<212> PRT

<213> Mus musculus

<400> 4

Val Ile Asn Ile Leu Ser Glu Pro Pro Lys Arg Lys Lys Arg Lys Asp
 1 5 10 15
 Ile Asn Thr Ile Glu Asp Ala Val Lys Leu Leu Gln Glu Cys Lys Lys
 20 25 30
 Ile Ile Val Leu Thr Gly Ala Gly Val Ser Val Ser Cys Gly Ile Pro
 35 40 45
 Asp Phe Arg Ser Arg Asp Gly Ile Tyr Ala Arg Leu Ala Val Asp Phe
 50 55 60
 Pro Asp Leu Pro Asp Pro Gln Ala Met Phe Asp Ile Glu Tyr Phe Arg
 65 70 75 80
 Lys Asp Pro Arg Pro Phe Phe Lys Phe Ala Lys Glu Ile Tyr Pro Gly
 85 90 95
 Gln Phe Gln Pro Ser Leu Cys His Lys Phe Ile Ala Leu Ser Asp Lys
 100 105 110
 Glu Gly Lys Leu Leu Arg Asn Tyr Thr Gln Asn Ile Asp Thr Leu Glu
 115 120 125
 Gln Val Ala Gly Ile Gln Arg Ile Leu Gln Cys His Gly Ser Phe Ala
 130 135 140
 Thr Ala Ser Cys Leu Ile Cys Lys Tyr Lys Val Asp Cys Glu Ala Val
 145 150 155 160
 Arg Gly Asp Ile Phe Asn Gln Val Val Pro Arg Cys Pro Arg Cys Pro
 165 170 175

Ala Asp Glu Pro Leu Ala Ile Met Lys Pro Glu Ile Val Phe Phe Gly
 180 185 190
 Glu Asn Leu Pro Glu Gln Phe His Arg Ala Met Lys Tyr Asp Lys Asp
 195 200 205
 Glu Val Asp Leu Leu Ile Val Ile Gly Ser Ser Leu Lys Val Arg Pro
 210 215 220
 Val Ala Leu Ile Pro Ser Ser Ile Pro His Glu Val Pro Gln Ile Leu
 225 230 235 240
 Ile Asn Arg Glu Pro
 245

<210> 5

<211> 237

<212> PRT

<213> Escherichia coli

<400> 5

Met Met Glu Asn Pro Arg Val Leu Val Leu Thr Gly Ala Gly Ile Ser
 1 5 10 15
 Ala Glu Ser Gly Ile Arg Thr Phe Arg Ala Ala Asp Gly Leu Trp Glu
 20 25 30
 Glu His Arg Val Glu Asp Val Ala Thr Pro Glu Gly Phe Ala Arg Asn
 35 40 45
 Pro Gly Leu Val Gln Thr Phe Tyr Asn Ala Arg Arg Gln Gln Leu Gln
 50 55 60
 Gln Pro Glu Ile Gln Pro Asn Ala Ala His Leu Ala Leu Ala Asn Leu
 65 70 75 80
 Lys Lys Arg Leu Ala Ile Ala Phe Leu Leu Val Thr Gln Asn Ile Asp
 85 90 95
 Asn Leu His Glu Arg Ala Gly Asn Arg Asn Ile Ile Gln Met His Gly
 100 105 110
 Glu Leu Leu Lys Val Arg Cys Ser Gln Ser Gly Gln Ile Leu Glu Trp
 115 120 125
 Asn Gly Asp Val Met Pro Glu Asp Lys Cys His Cys Cys Gln Phe Pro
 130 135 140
 Ala Pro Leu Arg Pro His Val Val Trp Phe Gly Glu Met Pro Leu Gly
 145 150 155 160
 Met Asp Glu Ile Tyr Met Ala Leu Ser Met Ala Asp Ile Phe Ile Ala
 165 170 175
 Ile Gly Thr Ser Gly His Val Tyr Pro Ala Ala Gly Phe Val His Glu
 180 185 190
 Ala Lys Leu His Gly Ala His Thr Val Glu Leu Asn Leu Glu Pro Ser
 195 200 205
 Gln Val Gly Asn Glu Phe Glu Glu Lys His Tyr Gly Pro Ala Ser Gln
 210 215 220
 Val Val Pro Glu Phe Val Asp Lys Phe Leu Lys Gly Leu
 225 230 235

<210> 6

<211> 21

<212> PRT

<213> Artificial Sequence

<220>

<223> Synthetic Peptide

<400> 6

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Ala Arg Thr Lys Gln Thr Ala Arg Lys Ser Thr Gly Gly Lys Ala Pro
1 5 10 15
Arg Lys Gln Leu Cys
20

<210> 7
<211> 20
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Peptide

<400> 7
Ser Gly Arg Gly Lys Gly Gly Lys Gly Leu Gly Lys Gly Gly Ala Lys
1 5 10 15
Arg His Arg Cys
20

<210> 8
<211> 19
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Peptide

<400> 8
Ala Gly Gly Lys Gly Gly Lys Gly Met Gly Lys Val Gly Ala Lys Arg
1 5 10 15
His Ser Cys

<210> 9
<211> 128
<212> PRT
<213> Mus musculus

<400> 9
Ile Val Leu Thr Gly Ala Gly Val Ser Val Ser Cys Gly Ile Pro Asp
1 5 10 15
Phe Arg Ser Arg Asp Gly Ile Tyr Ala Arg Leu Ala Val Asp Phe Pro
20 25 30
Asp Leu Pro Asp Pro Gln Ala Met Phe Asp Ile Glu Tyr Phe Arg Lys
35 40 45
Asp Pro Arg Pro Phe Phe Lys Phe Ala Lys Glu Ile Tyr Pro Gly Gln
50 55 60
Phe Gln Pro Ser Leu Cys His Lys Phe Ile Ala Leu Ser Asp Lys Glu
65 70 75 80
Gly Lys Leu Leu Arg Asn Tyr Thr Gln Asn Ile Asp Thr Leu Glu Gln
85 90 95
Val Ala Gly Ile Gln Arg Ile Leu Gln Cys His Gly Ser Phe Ala Thr
100 105 110
Ala Ser Cys Leu Ile Cys Lys Tyr Lys Val Asp Cys Glu Ala Val Arg
115 120 125

<400>	11															
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1				5					10					15		
Thr	Ile	Asp	His	Phe	Ile	Gln	Lys	Leu	His	Thr	Ala	Arg	Lys	Ile	Leu	
			20					25					30			
Val	Leu	Thr	Gly	Ala	Gly	Val	Ser	Thr	Ser	Leu	Gly	Ile	Pro	Asp	Phe	
		35					40					45				
Arg	Ser	Ser	Glu	Gly	Phe	Tyr	Ser	Lys	Ile	Lys	His	Leu	Gly	Leu	Asp	
	50					55					60					
Asp	Pro	Gln	Asp	Val	Phe	Asn	Tyr	Asn	Ile	Phe	Met	His	Asp	Pro	Ser	
65				70						75					80	
Val	Phe	Tyr	Asn	Ile	Ala	Asn	Met	Val	Leu	Pro	Pro	Glu	Lys	Ile	Tyr	
			85						90					95		
Ser	Pro	Leu	His	Ser	Phe	Ile	Lys	Met	Leu	Gln	Met	Lys	Gly	Lys	Leu	
			100				105						110			
Leu	Arg	Asn	Tyr	Thr	Gln	Asn	Ile	Asp	Asn	Leu	Glu	Ser	Tyr	Ala	Gly	
		115					120				125					
Ile	Ser	Thr	Asp	Lys	Leu	Val	Gln	Cys	His	Gly	Ser	Phe	Ala	Thr	Ala	
	130					135				140						
Thr	Cys	Val	Thr	Cys	His	Trp	Asn	Leu	Pro	Gly	Glu	Arg	Ile	Phe	Asn	
145				150						155					160	
Lys	Ile	Arg	Asn	Leu	Glu	Leu	Pro	Leu	Cys	Pro	Tyr	Cys	Tyr	Lys	Lys	
			165						170					175		
Arg	Arg	Glu	Tyr	Phe	Pro	Glu	Gly	Tyr	Asn	Asn	Lys	Val	Gly	Val	Ala	
		180					185					190				
Ala	Ser	Gln	Gly	Ser	Met	Ser	Glu	Arg	Pro	Pro	Tyr	Ile	Leu	Asn	Ser	
	195						200				205					
Tyr	Gly	Val	Leu	Lys	Pro	Asp	Ile	Thr	Phe	Phe	Gly	Glu	Ala	Leu	Pro	
	210					215					220					

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<210> 12
<211> 327
<212> PRT
<213> Mus musculus
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Ile	Asn	Thr	Ile	Glu	Asp	Ala	Val	Lys	Leu	Leu	Gln	Glu	Cys	Lys	Lys
			20					25					30		
Ile	Ile	Val	Leu	Thr	Gly	Ala	Gly	Val	Ser	Val	Ser	Cys	Gly	Ile	Pro
			35				40					45			
Asp	Phe	Arg	Ser	Arg	Asp	Gly	Ile	Tyr	Ala	Arg	Leu	Ala	Val	Asp	Phe
	50					55					60				
Pro	Asp	Leu	Pro	Asp	Pro	Gln	Ala	Met	Phe	Asp	Ile	Glu	Tyr	Phe	Arg
65					70					75				80	
Lys	Asp	Pro	Arg	Pro	Phe	Phe	Lys	Phe	Ala	Lys	Glu	Ile	Tyr	Pro	Gly
				85					90					95	
Gln	Phe	Gln	Pro	Ser	Leu	Cys	His	Lys	Phe	Ile	Ala	Leu	Ser	Asp	Lys
			100					105					110		
Glu	Gly	Lys	Leu	Leu	Arg	Asn	Tyr	Thr	Gln	Asn	Ile	Asp	Thr	Leu	Glu
		115					120					125			
Gln	Val	Ala	Gly	Ile	Gln	Arg	Ile	Leu	Gln	Cys	His	Gly	Ser	Phe	Ala
	130					135					140				
Thr	Ala	Ser	Cys	Leu	Ile	Cys	Lys	Tyr	Lys	Val	Asp	Cys	Glu	Ala	Val
145					150					155				160	
Arg	Gly	Asp	Ile	Phe	Asn	Gln	Val	Val	Pro	Arg	Cys	Pro	Arg	Cys	Pro
				165					170					175	
Ala	Asp	Glu	Pro	Leu	Ala	Ile	Met	Lys	Pro	Glu	Ile	Val	Phe	Phe	Gly
			180					185					190		
Glu	Asn	Leu	Pro	Glu	Gln	Phe	His	Arg	Ala	Met	Lys	Tyr	Asp	Lys	Asp
		195					200					205			
Glu	Val	Asp	Leu	Leu	Ile	Val	Ile	Gly	Ser	Ser	Leu	Lys	Val	Arg	Pro
	210					215					220				
Val	Ala	Leu	Ile	Pro	Ser	Ser	Ile	Pro	His	Glu	Val	Pro	Gln	Ile	Leu
225					230					235				240	
Ile	Asn	Arg	Glu	Pro	Leu	Pro	His	Leu	His	Phe	Asp	Val	Glu	Leu	Leu
				245					250					255	
Gly	Asp	Cys	Asp	Val	Ile	Ile	Asn	Glu	Leu	Cys	His	Arg	Leu	Gly	Gly
			260					265					270		
Glu	Tyr	Ala	Lys	Leu	Cys	Cys	Asn	Pro	Val	Lys	Leu	Ser	Glu	Ile	Thr
		275					280					285			

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Glu Lys Pro Pro Arg Pro Gln Lys Glu Leu Val His Leu Ser Glu Leu
290 295 300
Pro Pro Thr Pro Leu His Ile Ser Glu Asp Ser Ser Ser Pro Glu Arg
305 310 315 320
Thr Val Pro Gln Asp Ser Ser
325

<210> 13
<211> 237
<212> PRT
<213> Escherichia coli

<400> 13
Met Met Glu Asn Pro Arg Val Leu Val Leu Thr Gly Ala Gly Ile Ser
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Ala Glu Ser Gly Ile Arg Thr Phe Arg Ala Ala Asp Gly Leu Trp Glu
20 25 30
Glu His Arg Val Glu Asp Val Ala Thr Pro Glu Gly Pro Ala Arg Asn
35 40 45
Pro Gly Leu Val Gln Thr Phe Tyr Asn Ala Arg Arg Gln Gln Leu Gln
50 55 60
Gln Pro Glu Ile Gln Pro Asn Ala Ala His Leu Ala Leu Ala Asn Leu
65 70 75 80
Lys Lys Arg Leu Ala Ile Ala Phe Leu Leu Val Thr Gln Asn Ile Asp
85 90 95
Asn Leu His Glu Arg Ala Gly Asn Arg Asn Ile Ile Gln Met His Gly
100 105 110
Glu Leu Leu Lys Val Arg Cys Ser Gln Ser Gly Gln Ile Leu Glu Trp
115 120 125
Asn Gly Asp Val Met Pro Glu Asp Lys Cys His Cys Cys Gln Phe Pro
130 135 140
Ala Pro Leu Arg Pro His Val Val Trp Phe Gly Glu Met Pro Leu Gly
145 150 155 160
Met Asp Glu Ile Tyr Met Ala Leu Ser Met Ala Asp Ile Phe Ile Ala
165 170 175
Ile Gly Thr Ser Gly His Val Tyr Pro Ala Ala Gly Phe Val His Glu
180 185 190
Ala Lys Leu His Gly Ala His Thr Val Glu Leu Asn Leu Glu Pro Ser
195 200 205
Gln Val Gly Asn Glu Phe Glu Glu Lys His Tyr Gly Pro Ala Ser Gln
210 215 220
Val Val Pro Glu Phe Val Asp Lys Phe Leu Lys Gly Leu
225 230 235

<210> 14
<211> 106
<212> PRT
<213> Saccharomyces cerevisiae

<400> 14
Ile Leu Val Leu Thr Gly Ala Gly Val Ser Thr Ser Leu Gly Ile Pro
1 5 10 15
Asp Phe Arg Ser Ser Glu Gly Phe Tyr Ser Lys Ile Lys His Leu Gly
20 25 30
Leu Asp Asp Pro Gln Asp Val Phe Asn Tyr Asn Ile Phe Met His Asp
35 40 45

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Pro Ser Val Phe Tyr Asn Ile Ala Asn Met Val Leu Pro Pro Glu Lys
50 55 60
Ile Tyr Ser Pro Leu His Ser Phe Ile Lys Met Leu Gln Met Lys Gly
65 70 75 80
Lys Leu Leu Arg Asn Tyr Thr Gln Asn Ile Asp Asn Leu Glu Ser Tyr
85 90 95
Ala Gly Ile Ser Thr Asp Lys Leu Val Gln
100 105

<210> 15

<211> 106

<212> PRT

<213> *Saccharomyces cerevisiae*

<400> 15

Ile Leu Val Leu Thr Gly Ala Gly Val Ser Thr Ser Leu Gly Ile Pro
1 5 10 15
Asp Phe Arg Ser Ser Glu Gly Phe Tyr Ser Lys Ile Arg His Leu Gly
20 25 30
Leu Glu Asp Pro Gln Asp Val Phe Asn Leu Asp Ile Phe Leu Gln Asp
35 40 45
Pro Ser Val Phe Tyr Asn Ile Ala His Met Val Leu Pro Pro Glu Asn
50 55 60
Met Tyr Ser Pro Leu His Ser Phe Ile Lys Met Leu Gln Asp Lys Gly
65 70 75 80
Lys Leu Leu Arg Asn Tyr Thr Gln Asn Ile Asp Asn Leu Glu Ser Tyr
85 90 95
Ala Gly Ile Asp Pro Asp Lys Leu Val Gln
100 105

<210> 16

<211> 107

<212> PRT

<213> *Saccharomyces cerevisiae*

<400> 16

Val Ile Phe Met Val Gly Ala Gly Ile Ser Thr Ser Cys Gly Ile Pro
1 5 10 15
Asp Phe Arg Ser Pro Gly Thr Gly Leu Tyr His Asn Leu Ala Arg Leu
20 25 30
Lys Leu Pro Tyr Pro Glu Ala Val Phe Asp Val Asp Phe Phe Gln Ser
35 40 45
Asp Pro Leu Pro Phe Tyr Thr Leu Ala Lys Glu Leu Tyr Pro Gly Asn
50 55 60
Phe Arg Pro Ser Lys Phe His Tyr Leu Leu Lys Leu Phe Gln Asp Lys
65 70 75 80
Asp Val Leu Lys Arg Val Tyr Thr Gln Asn Ile Asp Thr Leu Glu Arg
85 90 95
Gln Ala Gly Val Lys Asp Asp Leu Ile Ile Glu
100 105

<210> 17

<211> 131

<212> PRT

<213> *Saccharomyces cerevisiae*

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<400> 17

Ile Ala Cys Leu Thr Gly Ala Gly Ile Ser Cys Asn Ala Gly Ile Pro
1 5 10 15
Asp Phe Arg Ser Ser Asp Gly Leu Tyr Asp Leu Val Lys Lys Asp Cys
20 25 30
Ser Gln Tyr Trp Ser Ile Lys Ser Gly Arg Glu Met Phe Asp Ile Ser
35 40 45
Leu Phe Arg Asp Asp Phe Lys Ile Ser Ile Phe Ala Lys Phe Met Glu
50 55 60
Arg Leu Tyr Ser Asn Val Gln Leu Ala Lys Pro Thr Lys Thr His Lys
65 70 75 80
Phe Ile Ala His Leu Lys Asp Arg Asn Lys Leu Leu Arg Cys Tyr Thr
85 90 95
Gln Asn Ile Asp Gly Leu Glu Glu Ser Ile Gly Leu Thr Leu Ser Asn
100 105 110
Arg Lys Leu Pro Leu Thr Ser Phe Ser Ser His Trp Lys Asn Leu Asp
115 120 125
Val Val Gln
130

<210> 18

<211> 117

<212> PRT

<213> *Saccharomyces cerevisiae*

<400> 18

Met Val Val Val Ser Gly Ala Gly Ile Ser Val Ala Ala Gly Ile Pro
1 5 10 15
Asp Phe Arg Ser Ser Glu Gly Ile Phe Ser Thr Val Asn Gly Gly Ser
20 25 30
Gly Lys Asp Leu Phe Asp Tyr Asn Arg Val Tyr Gly Asp Glu Ser Met
35 40 45
Ser Leu Lys Phe Asn Gln Leu Met Val Ser Leu Phe Arg Leu Ser Lys
50 55 60
Asn Cys Gln Pro Thr Lys Phe His Glu Met Leu Asn Glu Phe Ala Arg
65 70 75 80
Asp Gly Arg Leu Leu Arg Leu Tyr Thr Gln Asn Ile Asp Gly Leu Asp
85 90 95
Thr Gln Leu Pro His Leu Ser Thr Asn Val Pro Leu Ala Lys Pro Ile
100 105 110
Pro Ser Thr Val Gln
115

<210> 19

<211> 106

<212> PRT

<213> *Mus musculus*

<400> 19

Ile Ile Val Leu Thr Gly Ala Gly Val Ser Val Ser Cys Gly Ile Pro
1 5 10 15
Asp Phe Arg Ser Arg Asp Gly Ile Tyr Ala Arg Leu Ala Val Asp Phe
20 25 30
Pro Asp Leu Pro Asp Pro Gln Ala Met Phe Asp Ile Glu Tyr Phe Arg
35 40 45
Lys Asp Pro Arg Pro Phe Phe Lys Phe Ala Lys Glu Ile Tyr Pro Gly
50 55 60

12/23

Gln Phe Gln Pro Ser Leu Cys His Lys Phe Ile Ala Leu Ser Asp Lys
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His Pro Glu Pro Phe Phe Ala Leu Ala Lys Glu Leu Tyr Pro Gly Gln
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Phe Lys Pro Thr Ile Cys His Tyr Phe Ile Arg Leu Leu Lys Glu Lys
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35 40 45
Thr His Tyr Phe Leu Arg Leu Leu His Asp Lys Glu Leu Leu Leu Arg
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Pro Ile Gln His Ile Asp Phe Val Pro Val Leu Arg Ser Ala Ser Gly
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Glu Val Ala Leu Ala Leu Gln Ala Ala Gly Ser Pro Ser Ala Ala Ala
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Ala Met Glu Ala Ala Ser Gln Pro Ala Asp Glu Pro Leu Arg Lys Arg
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Pro Arg Arg Asp Gly Pro Gly Leu Gly Arg Ser Pro Gly Glu Pro Ser
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Ala Ala Val Ala Pro Ala Ala Ala Gly Cys Glu Ala Ala Ser Ala Ala
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Ala Pro Ala Ala Leu Trp Arg Glu Ala Ala Gly Ala Ala Ala Ser Ala
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Glu Arg Glu Ala Pro Ala Thr Ala Val Ala Gly Asp Gly Asp Asn Gly
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Ser Gly Leu Arg Arg Glu Pro Arg Ala Ala Asp Asp Phe Asp Asp Asp
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Glu Gly Glu Glu Glu Asp Glu Ala Ala Ala Ala Ala Ala Ala Ala Ala
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Ser Ser Ser Asp Trp Thr Pro Arg Pro Arg Ile Gly Pro Tyr Thr Phe
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gtt cag caa cat ctc atg att ggc acc gat cct cga aca att ctt aaa 632
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Leu Trp Gln Ile Val Ile Asn Ile Leu Ser Glu Pro Pro Lys Arg Lys	
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Glu Cys Lys Lys Ile Ile Val Leu Thr Gly Ala Gly Val Ser Val Ser	
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Cys Gly Ile Pro Asp Phe Arg Ser Arg Asp Gly Ile Tyr Ala Arg Leu	
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Ala Val Asp Phe Pro Asp Leu Pro Asp Pro Gln Ala Met Phe Asp Ile	
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Glu Tyr Phe Arg Lys Asp Pro Arg Pro Phe Phe Lys Phe Ala Lys Glu	
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Ile Tyr Pro Gly Gln Phe Gln Pro Ser Leu Cys His Lys Phe Ile Ala	
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Gly Ser Phe Ala Thr Ala Ser Cys Leu Ile Cys Lys Tyr Lys Val Asp	
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Cys Glu Ala Val Arg Gly Asp Ile Phe Asn Gln Val Val Pro Arg Cys	
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Pro Arg Cys Pro Ala Asp Glu Pro Leu Ala Ile Met Lys Pro Glu Ile	
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Tyr Asp Lys Asp Glu Val Asp Leu Leu Ile Val Ile Gly Ser Ser Leu	
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Leu	Ser	Glu	Leu	Pro	Pro	Thr	Pro	Leu	His	Ile	Ser	Glu	Asp	Ser	Ser	
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Ser	Pro	Glu	Arg	Thr	Val	Pro	Gln	Asp	Ser	Ser	Val	Ile	Ala	Thr	Leu	
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Ser	Ser	Cys	Val	Glu	Glu	Lys	Pro	Gln	Glu	Val	Gln	Thr	Ser	Arg	Asn	
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Ser	Thr	Ala	Asp	Lys	Asn	Glu	Arg	Thr	Ser	Val	Ala	Glu	Thr	Val	Arg	
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Lys	Cys	Trp	Pro	Asn	Arg	Leu	Ala	Lys	Glu	Gln	Ile	Ser	Lys	Arg	Leu	
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Glu	Gly	Asn	Gln	Tyr	Leu	Phe	Val	Pro	Pro	Asn	Arg	Tyr	Ile	Phe	His	
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Gly	Ala	Glu	Val	Tyr	Ser	Asp	Ser	Glu	Asp	Asp	Val	Leu	Ser	Ser	Ser	
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gaa gaa ccc ttg gaa gat gaa agt gaa att gaa gaa ttc tac aat ggc 2120
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 680 685 690

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 710 715 720

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 115 120 125
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 Tyr Thr Phe Val Gln Gln His Leu Met Ile Gly Thr Asp Pro Arg Thr
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 Ile Leu Lys Asp Leu Leu Pro Glu Thr Ile Pro Pro Pro Glu Leu Asp
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 Asp Met Thr Leu Trp Gln Ile Val Ile Asn Ile Leu Ser Glu Pro Pro
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 305 310 315 320
 Phe Ile Ala Leu Ser Asp Lys Glu Gly Lys Leu Leu Arg Asn Tyr Thr
 325 330 335
 Gln Asn Ile Asp Thr Leu Glu Gln Val Ala Gly Ile Gln Arg Ile Leu
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 Gln Cys His Gly Ser Phe Ala Thr Ala Ser Cys Leu Ile Cys Lys Tyr
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 Pro Arg Cys Pro Arg Cys Pro Ala Asp Glu Pro Leu Ala Ile Met Lys
 385 390 395 400
 Pro Glu Ile Val Phe Phe Gly Glu Asn Leu Pro Glu Gln Phe His Arg
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 Ala Met Lys Tyr Asp Lys Asp Glu Val Asp Leu Leu Ile Val Ile Gly
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 Ser Ser Leu Lys Val Arg Pro Val Ala Leu Ile Pro Ser Ser Ile Pro
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 His Glu Val Pro Gln Ile Leu Ile Asn Arg Glu Pro Leu Pro His Leu
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 Val Pro Arg Ala Pro Thr Pro Phe Pro Trp Pro Ser Arg Thr Asp Ser
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 gac tcg gac act gag gga gga gcc act ggt gga gag gca gag atg gac 143
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 35 40 45
 ttc ctg agg aat tta ttc acc cag acc ctg ggc ctg ggt tcc caa aag 191
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 Glu Arg Leu Leu Asp Glu Leu Thr Leu Glu Gly Val Thr Arg Tyr Met
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 Gln Ser Glu Arg Cys Arg Lys Val Ile Cys Leu Val Gly Ala Gly Ile
 80 85 90 95
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 Ser Thr Ser Ala Gly Ile Pro Asp Phe Arg Ser Pro Ser Thr Gly Leu
 100 105 110
 tat gca aac ctg gag aag tac cac ctt cct tac cca gag gcc atc ttt 383
 Tyr Ala Asn Leu Glu Lys Tyr His Leu Pro Tyr Pro Glu Ala Ile Phe
 115 120 125

gag atc agc tac ttc aag aaa cat ccg gaa ccc ttc ttt gcc ott gcc 431
 Glu Ile Ser Tyr Phe Lys Lys His Pro Glu Pro Phe Phe Ala Leu Ala
 130 135 140

aag gag ctc tat ccc ggg cag ttc aag cca acc atc tgc cac tac ttc 479
 Lys Glu Leu Tyr Pro Gly Gln Phe Lys Pro Thr Ile Cys His Tyr Phe
 145 150 155

atc cgc ctg ctg aag gag aag ggg ctg ctg ctg cgc tgc tac acg cag 527
 Ile Arg Leu Leu Lys Glu Lys Gly Leu Leu Leu Arg Cys Tyr Thr Gln
 160 165 170 175

aac ata gac acg ctg gaa cga gtg gcg ggg ctg gag ccc cag gac ctg 575
 Asn Ile Asp Thr Leu Glu Arg Val Ala Gly Leu Glu Pro Gln Asp Leu
 180 185 190

gtg gag gcc cac ggc acc ttc tac aca tca cac tgt gtc aac acc tcc 623
 Val Glu Ala His Gly Thr Phe Tyr Thr Ser His Cys Val Asn Thr Ser
 195 200 205

tgc aga aaa gaa tac acg atg ggc tgg atg aaa gag aag att tct cag 671
 Cys Arg Lys Glu Tyr Thr Met Gly Trp Met Lys Glu Lys Ile Ser Gln
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 35 40 45
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 Arg Leu Leu Asp Glu Leu Thr Leu Glu Gly Val Thr Arg Tyr Met Gln
 65 70 75 80
 Ser Glu Arg Cys Arg Lys Val Ile Cys Leu Val Gly Ala Gly Ile Ser
 85 90 95
 Thr Ser Ala Gly Ile Pro Asp Phe Arg Ser Pro Ser Thr Gly Leu Tyr
 100 105 110
 Ala Asn Leu Glu Lys Tyr His Leu Pro Tyr Pro Glu Ala Ile Phe Glu
 115 120 125
 Ile Ser Tyr Phe Lys Lys His Pro Glu Pro Phe Phe Ala Leu Ala Lys
 130 135 140
 Glu Leu Tyr Pro Gly Gln Phe Lys Pro Thr Ile Cys His Tyr Phe Ile
 145 150 155 160

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Arg	Leu	Leu	Lys	Glu	Lys	Gly	Leu	Leu	Leu	Arg	Cys	Tyr	Thr	Gln	Asn
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Ile	Asp	Thr	Leu	Glu	Arg	Val	Ala	Gly	Leu	Glu	Pro	Gln	Asp	Leu	Val
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Arg	Lys	Glu	Tyr	Thr	Met	Gly	Trp	Met	Lys	Glu	Lys	Ile	Ser	Gln	Lys
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Gln	Leu	Pro	Gly	Val	Ser	Ser	Val								
225						230									

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